

Kim Dehler

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Population Health Indicators for a Public Health Portal in the North Carolina Health Information Exchange

Introduction

Over twenty years ago, the Institute of Medicine (IOM) released its report “The Future of Public Health” (Institute of Medicine, 1988). This report established assessment as a core public health function of every public health agency. The IOM recommends local public health agencies “regularly and systematically collect, assemble, analyze, and make information available on the health of the community, including statistics on health status, community health needs, and epidemiologic and other studies of health problems” (Institute of Medicine, 1988, p. 7). Since the IOM report, the definition and process for conducting a community health assessment (CHA) has evolved relative to implementation of various national and state initiatives (Friedman & Parrish, 2009; Irani, Bohn, Halasin, Landin & McCusker, 2006; National Association of City and County Health Officials [NACCHO], 2011). There is increased recognition that chronic diseases are not only the most prevalent and costly of health problems, accounting for 70% of all deaths, but they are also the most preventable. One result of this recognition has been the expansion of chronic disease prevention programs in state public health agencies. Many of these programs are believed to be effective, but program evaluation has suffered due to the lack of available high quality data at the community level. The need for this timely, quality data is critical for accurate assessment and evaluation to assure appropriate programs and policies are developed and implemented in a cost effective manner (Brownson and

Bright, 2004; Centers for Disease Control and Prevention, 2004). The purpose of this paper is to review the methods commonly used for community health assessment and improvement processes for the purposes of informing an emerging health information exchange about tools and performance indicators to assist with development of a public health data portal for chronic disease prevention activities.

Historically, chronic disease surveillance was conducted through mortality data from the CDC's National Vital Statistics System. Since the 1970s, multiple data systems have formed the foundation for chronic disease surveillance beginning with disease registries. In the 1980s and 1990s, additional surveillance systems were added, including the Nationwide Program of Cancer Registries to follow cancer incidence and mortality, and the Behavioral Risk Factor Surveillance System (BRFSS) to monitor behaviors through survey responses related to risk factors for leading causes of death (CDC, 2004). The BRFSS-based systems, in particular, have been critical to building state based chronic disease programs to identify groups of people at risk for disease and to monitor intervention programs (Brownson and Bright, 2004; CDC, 2010). As the field of public health surveillance continues to evolve, the tools of public health informatics are increasingly recognized as key to providing chronic disease program directors with the timely data collection and analysis necessary to evaluate effective interventions. Health reform initiatives, which emphasize information technology, provide an opportunity to improve efficiency in data collection, storage, analysis, and dissemination. Public health surveillance will benefit from increasing the capacity to conduct more rapid assessment, response, program evaluation and evidence-based decision making (CDC, 2011).

Passage of the Patient Protection and Affordable Care Act (PPACA) in 2010, which emphasizes quality patient care and community based preventive initiatives, has provided the most recent catalyst for improving quality and accelerating movement toward national health objectives. The Public Health Quality Forum (PHQF), which has members from all U.S. Department of Health and Human Services (DHHS) agencies, followed with the publication of “Priority Areas for Improvement of Quality in Public Health” (Honore’ & Scott, 2010). This came after the PHQF “Consensus Statement on Quality in the Public Health System” (DHHS, 2008) which included a definition of public health quality and characteristics of quality in the public health system. In “Priority Areas for Improvement of Quality in Public Health, (Honore’ and Scott) identify priority areas for improvement of quality in the public health system with the overriding need to have a systems-based coordinated approach to connect individual healthcare with community health. It describes the need to integrate improved data collection and analysis with population health, individual health, community health assessments and evidence-based practice.

Emerging issues over the past decade which impact public health practice and increase the complexity of community health assessment includes the following: an evolving definition of “population health”; new appreciation for socio-ecological determinants of health beyond the traditional medical model; recognized need for timely data availability and complex analysis; increased collaboration among community stakeholders; increased emphasis on evidence based medical practice; funder requirements for program performance indicators; and, new healthcare laws providing incentives to adopt electronic health records. It is within this context that the Community Care of Southern Piedmont (CCofSP), a Beacon Community Program in North Carolina, is implementing an electronic health information exchange, which includes a public

health data portal to assist with chronic disease surveillance and community-based healthcare improvement.

The Beacon Community Program is one of many provisions of the American Recovery and Reinvestment Act (ARRA) of 2009 and its Health Information Technology for Economic and Clinical Health (HITECH) component, which outlines a strategic plan for integration of health information technology (HIT) in the United States. The provisions of HITECH include adoption and “meaningful use” of electronic health records (EHR); regional extension centers and incentive payments to support healthcare providers in the adoption of EHR; formation of national and statewide electronic health information exchanges; and grants to fund Beacon Communities to develop models for improved healthcare delivery and population health. This law contains requirements for improved quality of care, increased efficiency, reduced costs and improved access to healthcare services. In other words, this law provides fundamental support for the Patient Protection and Affordable Care Act of 2010.

This HIT infrastructure should enable the electronic capture, exchange, measurement, analysis and reporting of data at all points of the healthcare delivery system. Quality measurements and assessment of healthcare improvement efforts will be reportable across multiple domains in a timely and cost efficient manner (Blumenthal & Tavenner, 2010; Buntin, Jain, & Blumenthal, 2010). These advancements, in the capture and sharing of digital patient information, hold promise for more targeted and revealing community health assessments.

Public health surveillance and disease prevention are a component of the new national health reform law. Public health surveillance is defined by Turnock (2004) as “systematic monitoring of health status of a population through collection, analysis, and interpretation of

health data in order to plan, implement and evaluate public health programs, including the need for public health action” (p.403). Under the new health reform law, public health surveillance is supported through the enhanced health information exchange infrastructure as well as through specific grants for increased epidemiologic capacity and expansion of laboratory analysis and reporting (Buntin, Jain, & Blumenthal, 2010).

The Beacon Community Cooperative Agreement Program provides funding to selected communities across the nation to demonstrate ways adoption of HIT can improve healthcare access, quality, cost efficiency, and population health. The vision is for every American to have an EHR accessible by healthcare practitioners with the expectation of improving provider decisions, service delivery, and patient outcomes, as well as reforming payment structures (Maxson et al., 2010). In order for such interoperability to exist, medical providers and hospitals must incorporate meaningful use of EHR into clinical practices, and a statewide health information exchange must exist between healthcare entities.

The Beacon grants support communities that already exhibit high rates of HIT adoption by enabling them to work on regionally-focused reform initiatives. Communities were selected through a competitive bidding process and were given three years to demonstrate how meaningful use of HIT can improve healthcare efficiency, healthcare quality and population health. Priority interventions of the Beacon Communities include targeting specific health conditions such as diabetes, asthma and vascular disease for quality improvement initiatives; establishing cost efficiency improvement goals such as reducing emergency department visits and preventable hospital readmissions; and meeting population health objectives such as improving immunizations rates, improving rates of smoking cessation, increasing the use of

preventive screenings and reducing health disparities. They hope to accomplish these by using HIT to increase availability of patient data, and by connecting community healthcare and public health entities through HIE (Maxson et al., 2010).

North Carolina's Community Care of Southern Piedmont (CCofSP) was one of seventeen communities in the nation to be awarded a Beacon grant. CCofSP is one of several local networks that make up Community Care of North Carolina, a statewide partnership of healthcare providers. The CCofSP serves a three county region that encompasses Rowan, Stanly, and Cabarrus Counties. As previously described, an initial directive to each Beacon community was to focus on validating health priorities identified by recent community health assessments and to improve preventive care. Cost efficiency goals involve reducing unnecessary emergency department visits, hospital readmissions and duplicate imaging tests. This requires sharing the right data in a timely way across providers and patients which the CCoSP Community expanded to include free clinics, federally qualified health centers, small medical practices, public health departments, school nurses and parish nurses (Pilkington, 2011). An early goal has been to engage physician practices to meet the "meaningful use" requirements of clinical quality reporting. The "meaningful use" of HIT is exemplified by tracking utilization of individual health and wellness services covered by Medicare and Medicaid as well as experimentation with healthcare messaging to patients through personal technology devices (Buntin, Jain, & Blumenthal, 2010).

There are 4 phases of the CCofSP Beacon Community Project. Early phases focused on identifying the data needed to follow emergency department visits, ambulatory care and hospital-based medical practice. Currently, the CCofSP public health and case management community is

limited to insurance claims data which lack timeliness as well as the clinical elements necessary for chronic disease tracking and public health interventions. An understanding of the data requirements and measurements for baseline assessments of healthcare delivery processes and interventions is fundamental. Specific objectives that CCofSP is committed to improve involve reduction of avoidable hospital admissions and emergency department visits, particularly among asthmatic patients; improved diabetes management; and decreased rates of premature deaths caused by congestive heart failure. The public health data portal draws on earlier phases of data acquisition from patient health records. With patient identifiers removed, aggregated data can be used for syndrome surveillance and public health intervention programs for chronic diseases such as diabetes, congestive heart failure and asthma (Pilkington, 2011).

Objectives of the CCofSP public health portal include the following:

- To partially address data collection and reporting requirements of the community health assessment component of the new health reform law
- To enable chronic disease outcomes evaluations of public health prevention interventions
- To inform policy makers with timely information about the public health status of their communities and to encourage investment of resources to improve community health
- To promote the adoption of best practice in healthcare prevention by community health providers

The current research project will assist the CCofSP in selecting the outcomes indicators for chronic disease prevention most amenable for tracking through electronic health record data elements in the proposed public health data portal. The following questions will be studied:

- What are common public health reporting tools currently deployed in the US for community health assessment, and what outcomes indicator sets are commonly used for chronic disease surveillance?
- Which of these assessment tools and outcomes indicators could inform CCofSP regarding the public health data elements and reporting needs for the proposed system of community health information exchange?
- What are the public health leadership issues that may impact the ability to develop and sustain the proposed public health data portal for chronic disease prevention?

Research Methods

The PubMed database was searched for peer reviewed journals using the key word phrases “community health assessment,” “public health assessment,” “population health,” “community health status,” “community health report cards,” “community health dashboards,” “community health indicators,” “population health metrics,” “electronic health records,” “health information technology,” “Affordable Care Act,” “American Recovery and Reinvestment Act,” “Beacon Community Program.” Information on performance indicators were searched through the terms “healthcare quality indicators,” “health determinants,” and “HEDIS measures.” “Leadership” issues were identified within pertinent articles retrieved through other search terms as well within the websites identified below. Google Scholar was used to find more recent

articles as follow-up to selected older publications. Google was used to search for institutional websites referenced in other documents. Additional articles were discovered by reviewing the bibliographies of the pertinent articles retrieved from database searches. Other resources used to complement scholarly articles were websites for private foundation and federal health agencies which sponsor community health projects. These included the Centers for Disease Control and Prevention (CDC), the Office of National Coordinator for Health Information Technology (ONC), the Rand Foundation, National Association of County and City Health Officials (NACCHO), the Robert Wood Johnson Foundation (RWJF), the Commonwealth Fund, and the Institute for Healthcare Improvement (IHI). Additional websites including the Kaiser Family Foundation, the Partners in Information Access for the Public Health Workforce, and the Centers for Disease Control for Researchers were searched using key words and phrases as described previously.

Research Results

The results of the literature review will focus on the different topics being addressed in the research questions beginning with community health assessments followed by performance indicator applications for public health and clinical healthcare settings.

Community Health Assessment

In general, the search terms “community health assessment” and “community health status indicators” yielded the most results for peer reviewed articles related to community health assessment and population health monitoring. A few studies reviewed the evolution of public health assessment tools since the early 1990s. In 2009, Friedman & Parrish presented a chronology of developmental milestones in these instruments. An early federal response to the

1988 IOM statement, as well as to the national health objectives in Healthy People 2000, was the Assessment Initiative (AI) established by CDC in 1992. The AI supports state-centered assessment programs, with the goal of identifying innovative projects and best practices to build assessment capacity in the United States (CDC, 2011; Sosin & Thacker, 2002). North Carolina contributed to the AI with work in the NC Community Health Assessment Guide (NC Division of Public Health, 2010).

Various frameworks and guides have been developed to facilitate assessment. Selection of assessment tools may depend on community characteristics such as stakeholder involvement, data collection and analytic resources, and geographical characteristics. According to a NACCHO chart book on local health agency infrastructure (NACCHO, 2001, p. 74), established health assessment tools developed at the state or national level have been more commonly used by small, rural communities where as larger metropolitan areas may develop their own process. Depending on the particular community, a hybrid of assessment tools may be utilized to reflect stakeholder diversity (NACCHO, 2011). Stoto, Straus, Bohn & Irani (2009) presented results of a web-based survey tool used to assess characteristics of successful and unsuccessful CHAs. With regard to assessment indicator selection, respondents rated the following characteristics most desirable: the need for measurements to reflect the most important positive and negative aspects of the community's health; to allow comparisons with peer communities, specified benchmarks, and comparisons over time; to assess health disparities between subgroups of the community population; to serve as a guide for prioritizing intervention activities and a comprehensive strategic plan for community improvement.

Two nationally recognized models for community assessment and improvement are the Community Health Improvement Process (CHIP) developed by the IOM (IOM, 1997) and Mobilizing for Action through Planning and Partnerships (MAPP) developed by NACCHO and the CDC (NACCHO, 2011). The CHIP incorporates community assessment into a larger improvement process involving multiple entities within the community in a collaborative partnership towards community health improvement. The process is implemented in the form of two cycles: the Problem Identification and Prioritization Cycle and the Analysis and Implementation Cycle. For the first cycle, the IOM originally proposed a set of indicators adopted from Healthy People initiatives to track progress towards meeting health objectives. Community stakeholders may contribute to a selection of indicators reflect unique needs of a particular community. Once specific health issues have been targeted for improvement, the CHIP starts the analysis and implementation cycle, including analysis of the issues, inventory of resources, development of health improvement strategy, identify accountable entities, development of performance indicators, implementation of health improvement strategy, and monitoring of performance outcomes (IOM, 1997).

MAPP recommends a series of focused assessments through which local health agencies and a broad range of community partners prioritize needs and formulate a strategic plan. A distinction of MAPP is the focus on the local public health system defined as the “human, informational, financial, and organizational resources, including public, private, and voluntary organizations and individuals that contribute to the public’s health” (NACCHO, 2011, The Elements of MAPP, ¶ 4). A key objective is to strengthen the efficiency and effectiveness of the local public health system through collaboration in the MAPP process. To connect local public health practice concepts with other public health initiatives, MAPP integrates the 10 Essential

Public Health Services to define performance indicators for local public health system activities (NACCHO, 2011). MAPP proceeds in six phases, starting with recruitment of community stakeholders and followed by a visioning exercise to identify common values and to formulate a vision of the community five to ten years in the future. Then, four MAPP assessments are completed: community themes/strengths assessment; local public health system assessment; community health status assessment; and forces of change assessment. The fourth phase involves identifying strategic issues through points of convergence in the assessment process. Goals and strategies are then determined for each issue and an action plan is formulated. This final phase is represented by a cycle of planning, implementation, and evaluation (NACCHO, 2011). Community health improvement is accomplished by this sustained process of collaboration among the community entities that comprise the local public health system.

From the descriptions provided, the research stresses that a community assessment and improvement process requires considerable investment of resources. Throughout the years, there has been increasing acknowledgement in the need for evaluation of CHA processes to determine how the investment of resources is actually impacting community health. In 2007, the AI called for manuscripts examining the impact of public health assessments. The *Journal of Public Health Management Practice* devoted a recent volume to evaluation of CHA (Martin, 2009). Friedman & Parrish (2009) describe a host of limitations that have compromised validity and reliability of CHAs. They then proposed an agenda for a recognized research evaluation of the CHA which includes the following: a formal definition of the CHA; defined CHA components with logic models for each; hypothesis testing that defines a successful CHA; multisite analysis; and instruments tested for validity and reliability (Friedman & Parrish, 2009).

Studnicki, Fisher, Eichelberger, Bridger, Angelon-Gaetz, & Nelsom (2011) attribute many of the limitations in models of CHA and population metrics to limitations in data. Their research provides a valuable link between discussions of quality issues in CHAs, population health and outcomes indicators. They identify five elements of decision support systems which are critical to success of efforts to assess and improve population health: “multidimensional, event level data; analytical capability; trained users; learning communities; and a cohesive evidence-based framework” (Studnicki, et al., p. 68). In contrast to the static aggregated methods of data collection and analysis used throughout the history of CHAs, they go on to describe advances in data computational software capable of providing granular data with dynamic community-level analysis. Cost-to-benefit issues are discussed in terms of investment in assessment compared to provision of primary care services and the cost of health department strategic plan based on erroneous CHAs. A UCLA study is reported to have found that a community health report card production took a resource-intensive 18 months to produce with a range of \$60,000 to \$1 million in cost (Studnicki, et al., p.70).

In identifying priority areas for improvement of quality in public health, the Public Health Quality Forum describes the need for improved population health metrics, information technology capacity, integration of evidence-based practices and advanced systems thinking in public health (Honore' & Scott, 2010). It further stresses the need to provide validated measures of performance and quality to strengthen sustainability and integration into policy development for population health improvement.

Health Indicators

Health indicators have been used to assess the state of health of a specified individual, group, or population; to monitor healthcare processes and outcomes; and, for health policy development (Chassin, Loeb, Schmaltz & Wachter, 2012; IOM, 1997, p. 26; Turnock, 2004, p. 391). A review of health indicators published in 2008 for The State of the USA (Wold, 2008) details the wide variation in indicator sets depending on the conceptual approach or focus area. Many use a broad health determinants model to characterize population health. Other indicators have been assembled to assess social determinants of health in a community, personal health risk behaviors, life-stage factors impacting health or progress towards general population health objectives. In recent years, as national momentum increases towards healthcare quality improvement and cost containment efforts, indicators of health system performance related to access, quality, and cost have evolved (Wold, 2008).

Indicators are generally assembled as a set and share the following common characteristics to make meaningful assessment of a community (IOM, 1997, p. 100; CDC, 2004; CDC, 2009; Wold, 2008; Metzler, Kanarek, Highsmith, Bialek, Straw, Auston, et al., 2008):

- They are relevant to important public health issues
- They rely on high quality data that is uniformly available for comparison across geographic areas
- They are developed by a consensus of reputable individuals and organizations
- They are actionable

Early initiatives that contributed to indicator development for chronic disease surveillance in the US include the Chronic Disease Indicators Project (CDI) (CDC, 2009; Metzler, Kanarek, Highsmith, Bialek, Straw, Auston, et al., 2008) and the Community Health Status Indicators Project (CHSI). The CDI, originally published in 1999 by the Council of State and Territorial Epidemiologists (CSTE), is a set of 97 cross-cutting indicators developed by consensus for use by states and large metropolitan areas to uniformly report chronic disease data. The CDI reports on diseases with significant public health burden and is intended to support the national health objectives of Healthy People 2010 (CDC, 2009). The CHSI is the result of a public-private partnership initiated in 2000 to assist public health professionals and community planners in health improvement efforts (Metzler, et al., 2008). Indicators chosen were consistent with Healthy People 2010 objectives. Access to county level data is available from a multitude of federal agencies. CHSI 2009, the most recent update, provides county-level health profiles for all US counties, which allows counties to monitor community health indicators with comparison to peer counties. This project will benefit greatly from technological advances that will provide comparable data below the county level (Metzler, et al, 2008; Department of Health and Human Services [DHHS], 2012).

Performance Indicators for Chronic Disease Tracking

The IOM (1997, p. 126) describes two kinds of indicator sets for community health improvement processes. The first includes indicators describing a community's broad sociodemographic characteristics, health status and resources which combine to provide a baseline community health profile. The second set of indicators is those which are used for

monitoring community health improvement efforts or “performance indicators”. Health outcomes indicators in the context of population health are considered performance indicators for monitoring effectiveness of public health intervention activities (IOM, 1997; Kindig, 2003).

The CCofSP public health data portal will be able to meet the needs for community health profiling as well as evaluation of chronic disease intervention activities. It is commonly known that chronic disease accounts for over 70% of today’s healthcare costs, and that percentage can be expected to increase as the population ages. It is also well known that most chronic diseases originate beyond the level of individual biology to include poor lifestyle choices (poor diet, lack of exercise, tobacco use, etc.) influenced by socioeconomic variables or “determinants” including political, social, and economic elements which impact the living environment. Kindig (2007) presents a definition and framework for population health derived from the work of Evans, Barer, & Marmour (1994) which describes the influence of health determinants in a specified population. Health status disparities result to the extent that socioeconomic differences exist between populations (CDC, 2004; Koh et al., 2010). Accordingly, measurements of health indicators must occur at the individual health level as well as at the community level. This context also supports the need for coordinated clinical and public health prevention activities (Honore’ & Scott, 2010). In reference to the CCofSP public health portal project, the selected preventive health measures specific to chronic diseases are measurable by data accessed in an electronic health record. Data elements reflect clinical care as well as socioeconomic characteristics for patients. These metrics will then be compared to standards of healthcare quality and evidence-based practice for medicine as well as inform community-based intervention activities.

Population metrics were the topic of a series of articles published by the CDC in the July 2010 edition of *Preventing Chronic Disease*. Parrish (2010) recommends metrics for population health outcomes that reflect “function and well being of the population”, specifically, outcomes that measure “mortality, functional status, and self-perceived health” (Parrish, 2010, p. 2). These measures reflect societal level conditions which also may be viewed as determinants of health, a topic addressed in other articles. The following metrics for population health outcomes are recommended: “life expectancy from birth or age-adjusted mortality rate; condition specific changes in life expectancy, or condition-specific or age-specific mortality rates; and self-reported level of health, functional status, and experiential status” (Parrish, 2009, p 1). Mortality and life expectancy measures are basic population health measures. The Health Related Quality of Life (HRQL) indices used extensively and validated are the National Health Interview Survey (NHIS), the Behavioral Risk Factor Surveillance System (BRFSS) and the National Health and Nutrition Examination Survey (NHANES). The author cautions users to evaluate instrument validation parameters before adopting survey instruments for community applications. For example, the designs of some national surveys such as NHIS and NHANES are validated for a certain sample size and the standard error may increase if these instruments were used for community subgroups (Parrish, 2010, p. 6).

Metrics essays by Bilheimer (2010) and Pestronk (2010) were summarized by Kindig, Booske, Siemering, Henry, and Remington (2010) in a final article in this CDC series. Primary issues identified in performance outcomes monitoring include limitations in available data, which compromise reliability and validity of metrics and complexity of data analysis when different health determinants are concentrated in different geographical areas and within geographical areas. Recommendations to achieve the goals of performance monitoring include:

precise metrics measured over short time frames to evaluate response to intervention activity; use of varied socioeconomic and demographic domains within communities; and communication to policy makers that utilizes easily understood performance dashboards or rankings (Kindig, Booske, Siemering, Henry & Remington, 2010).

Indicator Applications for Population Health

The review of health indicators presented by Wold (2008) categorized indicator sets into four focus areas of measurement: general health; quality of life; health systems performance; and “other” priority areas. Each report within these broad categories is characterized further according to data sources, key attributes, health context, and use. The most common population health indicators were related to vital statistics on birth and death, leading causes of death; self-reported behavioral characteristics; and reported quality of health.

The Mobilizing Action Toward Community Health (MATCH) project (University of Wisconsin Population Health Institute [UWPHI], 2010) represents a collaboration between the RWJF and the UWPHI to not only use population health indicators, but also to examine the effect on population health of strong community partnerships and reward systems for evidence based practices which improve population health. The County Health Rankings are a core component of the MATCH project. The 50 state health reports, which can be accessed through an interactive website, contain rankings of each county within the state according to analysis of indicators for health outcomes (mortality and morbidity), health factors (personal behaviors, clinical services characteristics, and socioeconomic determinants) and the physical environment (built environment and environmental quality). Although MATCH is a widely referenced population health initiative, the metrics used to measure county health characteristics are from

various data sources and are not always clearly defined. This reflects inconsistency across communities in availability of population health data. Sensitivity to detect population response to interventions is often jeopardized by lack of current data (Bilheimer, 2010). Each county included in the report can, however, be analyzed to see limitations of the data upon which the rankings are based (UWPHI, 2010).

Healthy People (Department of Health and Human Services, 2011) has been providing ten-year national health objectives for America for three decades. They include monitored benchmarks that guide federal and state health promotion disease prevention activities. The metrics used to establish benchmarks are defined and cross-referenced with other indicators in the Health Indicators Warehouse website (National Center for Health Statistics, 2011). Healthy People 2020 provides the framework for the current decade, including discussion of 42 topic areas with 1200 objectives for which baseline data has already been collected or is in progress (Department of Health and Human Services, 2011).

Clinical Performance Indicators

Measuring the quality of services provided is now commonplace across all healthcare settings. Indicators of healthcare quality can focus on outcome measures or process measures. Historically, process measures have been most commonly studied since the delivery of care in hospitals was the focus of improvement efforts (Chassin, Loeb, Schmaltz, & Wachter, 2010). In the community setting, where performance measures are being applied to population health improvement, chronic disease surveillance and program evaluation, outcomes performance indicators are receiving more attention. Medical care, although increasingly understood to represent only one of many determinants of health, is a point of outcomes performance

measurement in the domains of access to preventive services, early intervention and quality health care delivery

Managed care data is increasingly being used to assess the quality of healthcare provided to individuals. As the number of enrollees increases, the data collected from their health records and administrative transactions can represent a substantial proportion of a community population and yield information about the health of that population (Novick, Morrow & Mays, 2008, p. 319). Currently, the Healthcare Effectiveness Data and Information Set (HEDIS) by the National Committee for Quality Assurance (NCQA) contains standardized performance measures for quality of care delivered by public payers (Medicare, Medicaid, Federal Employees Health Benefit) and private payers. Health plan performance measurement is increasingly common. In 2010, 82% of the population of North Carolina received some degree of privately-funded, employer-paid or publically-funded health insurance (Kaiser Family Foundation, 2012).

Early quality measures were developed for HMOs and focused on use of recommended services. HEDIS measures are now the most widely used standards for ambulatory care and include measurement of outcome, resource use, and care coordination. NCQA specifies HEDIS standards for individual clinicians and clinician groups and is working with the federal agencies to translate these into electronic formats for EHR reporting and MU (meaningful use) participation (NCQA, 2011). HEDIS measures of healthcare performance include evidence-based clinical preventive measures, which are also part of community-based prevention activities addressing significant public health issues such as tobacco use, cancer, cardiovascular disease and stroke, diabetes, obesity, infant mortality and immunizations. For example, HEDIS includes performance measures for comprehensive diabetes management, controlling high blood pressure,

persistence of beta-blocker treatment after a heart attack, and cholesterol management for cardiovascular conditions. Community care coordination intermediate outcome measures in the form of laboratory results and patient satisfaction are also tracked for diabetics (NCQA, 2012).

A second organization playing a prominent role in the development of performance indicators associated with preventive healthcare is the U.S. Preventive Services Task Force (USPSTF) established in 1984 by the U.S. Public Health Service to provide evidence-based recommendations on effective clinical preventive services. Since 1998, it has been convened by the Agency for Healthcare Research and Quality (AHRQ), an independent panel of private sector experts in prevention and primary care (USPSTF, 2010). The USPSTF evaluates evidence for three types of clinical preventive services: screening, counseling, and preventive medications delivered to asymptomatic individuals in the primary care setting. Recommendations are assigned a letter grade based on the strength of evidence on the harms and benefits of a specific service. Current recommendations and clinical considerations are published annually as *The Guide to Clinical Preventive Services* and are seen as definitive standards for preventive services by individual healthcare providers, professional organizations, insurers and health plan administrators, including the Centers for Medicare and Medicaid Services (USPSTF, 2011). Recommendations of the USPSTF have been used by the NCQA in developing its HEDIS measures based on priorities of clinically preventable burden and cost effectiveness (Ockene, et al., 2007).

Clinical Performance Indicators and Population Health

While performance indicators in the clinical setting focus exclusively on individuals, population health focuses on the aggregate health of individuals and the determinants of health

previously described. One objective for the population health component of the CCofSP is to enable capturing and authorized sharing of digital patient information through the widespread adoption of EHR by healthcare practitioners and public health agencies with the goal to connect these EHRs to regional HIEs and the state's HIE. Once this system is in place, the data can be aggregated in various ways and analyzed to describe the health status of a community, with particular interest in chronic diseases. A second objective of the public health component utilizes EHR and claims data is to evaluate the delivery of preventive healthcare services by medical providers. Use of the USPSTF evidence-based guidelines for early detection of chronic disease can assist in assessment of medical practice patterns as determinants of population health.

Criticism of current EHR systems is the failure to capture data reflecting social determinants of health, although behavioral risk factors and socioeconomic characteristics are known to play a crucial role in determining health outcomes and population health disparities. The current selection of EHR indicators for the public portal reflect the initial need to readily integrate public health participation into the larger community of medical EHR practitioners early in this collaborative project. Although socio-behavioral elements are limited, there is data collected on gender, race/ethnicity, tobacco use, insurance status, income, geographic location all of which can be cross referenced for study of some of the social determinants of health outcomes. Appendix A lists proposed "Preventive Health Assessment Measures" not all of which are chronic diseases but are part of a broader health promotion disease prevention approach and measureable by EHR data elements. Appendix B identifies indicators for "Preventive Health Assessment Measures for Diabetes", a chronic disease which has been targeted for population health improvement by the CCofSP Beacon project and is already tracked by performance indicators of most medical practices . As the HIE groundwork expands it is anticipated that data

collection would be increased and performance measurement expanded and greater community partnership.

Leadership

The integration of population health into health reform law has brought public health into national HIT adoption efforts. Stakeholder collaboration and multi-organizational partnerships are necessary to achieve the interoperability of clinical-public health information systems necessary to build the proposed regional and statewide information exchanges. According to Rowitz (2006), public health leaders must have a vision which can be shared with others, possess a strong commitment to community, and awareness that public health is a shared responsibility among community partners (Rowitz, 2006, pg. 7). Targeted leadership strategies are required to engage and sustain stakeholder collaboration required for projects of this magnitude (Mays & Scutchfield, 2010).

Leaders need to be able to create a vision, and to convince others to go along with the steps necessary to bring about the change to attain the vision. When attempting to gain support for the public health portal, the potential for using advanced health information technology as an essential tool for public health practice needs to be communicated at all levels. In order for this to occur, the public health leadership must be able to have the vision of what will be possible through unprecedented electronic access to data bases, reports, and other information currently unavailable due to geographic and bureaucratic barriers to communication and information exchange (Baker, Menkens, & Porter, 2010, pg.102). Leaders must realize their potential for articulating this vision repeatedly to all community stakeholders. Systems thinking is important

for leaders to understand the issues of other community entities and the processes needed for getting the results that will improve population health.

It is also important for community partners to experience a sense of accomplishment as a team in early phases of project implementation. In the case of the public health portal development, utilizing data indicator sets already implemented in the EHR of medical practices is a method of reinforcing the ability to communicate in a “common language” while accomplishing mutual goals. For example, similar data elements can be used to meet medical practice standards at the same time as identifying preventive screening practices, which will meet population health objectives of the Beacon grant.

Because trust is critical to effective partnership, the public health agency must know the agendas of its’ partners, whether from the public or private sector (Rowitz, 2009). Opportunities for networking with other leaders on community issues need to be pursued in order for public health leaders to gain credibility. Community involvement needs to be sustained for the duration of community improvement efforts. These relationships are particularly important since partnerships are among potential competitors. A challenge for public health leadership is incentivizing private organizations to share their data, even though the greatest gain will not be realized for a long duration of time (Mays & Scutchfield, 2010).

A fundamental challenge to the success of HIE is the integration of electronic health records into healthcare as well as public health practice. The federal health care law has introduced financial incentives for both public and private entities, incorporating meaningful use of EHRs as defined by performance standards and patient volume. However, incentives will not be realized for immediately, and are not sustained. Alternative incentives to improve healthcare

need to be devised. Metrics in population health can serve to focus attention on population health measures, which in turn can reflect healthcare practices in the management of chronic disease (McGinnis, 2010).

Historically, public health has been delivered through multiple public and private agencies with varied resources. The national health information exchange provides an opportunity for a broader vision of public health. It also presents an opportunity for individual healthcare to be viewed within the context of population health. Public health participation in the health information exchange project can result in improved understanding of public health activities by other stakeholders and highlight the critical role of public health in the larger healthcare community. A challenge is that after successfully advocating for public health in the national HIT agenda, public health participation may fail to occur to the extent needed at the state and local levels (Public Health Data Standards Consortium, 2009). In public health specifically, more precise metrics over a shorter period of time may need to be implemented to foster continued integration of EHR. For example, giving pertinent, short-term feedback regarding performance of medical or public health practices may encourage continued partnership.

Challenges for Beacon Community public health leadership persist beyond the inclusion of population health in the national agenda. For creation of the intended health information exchange, sustained coordinated action at regional and local levels is required. Public health advocates need to be developed in non-traditional partnerships. Incentive plans may need to be developed so that healthcare providers continue participation in the health information exchange advocates for continued inclusion of public health needs and priorities in the HIT agenda. Since

public health agencies serve populations through various programs (immunization, communicable disease surveillance, chronic disease surveillance, etc), each has specific data support needs. In order to get buy-in for investment of resources, services will need to be prioritized by what will bring the most reward to stakeholders.

Discussion

The goal of this research was to assist the CCofSP in selecting the outcomes indicators for chronic disease prevention most amenable to tracking through electronic health record data elements that will be in the proposed public health data portal. The research findings will be discussed in the framework of the initial questions proposed.

- What are common public health reporting tools currently deployed in the US for community health assessment and outcomes indicator sets commonly used for chronic disease surveillance ? Common tools for community health assessment and improvement processes were identified as well considerations for selection of health status indicators or performance outcome indicators. As electronic data availability expands, the use of CHAs for comparison measures between peer counties, over time, and in comparison to selected benchmarks should become more timely and consistent. Outcomes measures will be available more quickly and allow more sensitive evaluation of public health interventions. Increased capability of a community to create unique indicator sets for performance measurement will be enhanced as proficiency in data management grows.

- Which of these assessment tools and outcomes indicators could inform CCofSP regarding the public health data elements and reporting needs for the proposed system of community health information exchange? The selection of an assessment tool and community health status measurements will continue to be dependent on the goals of stakeholders and the resources available to invest in the process. The indicators could be extracted from any of the indicator sets which have a chronic disease or determinants of health focus as long as community stakeholders agree that the EHR data elements need to expand to accommodate community improvement goals. As more social and behavioral data elements are cross referenced with performance indicators of chronic disease management, more health disparities will be likely be revealed.
- What are the leadership issues that may emerge in the process of developing a public data portal for chronic disease prevention within an electronic health information exchange? Developing a vision that can be communicated across community partnerships and sustained throughout the life of the project is a key starting point. Continuing education in public health informatics may be necessary to be a credible spokesperson. Incentive programs need to be developed to support continued commitment to the expansion of the health information exchange.

Conclusion

Historically, each public health program has operated in a silo according to program specific or jurisdictional standards often reinforced by federal funding mechanisms. The

integration of public health information with other health information systems can improve efficiency and quality across the system through timeliness of data collection, analysis, and use; data comprehensiveness (both population-wide and within jurisdictions); reduced manual operating costs; enhanced communication between healthcare providers. It is clear that improvement in population health depends on delivery of quality healthcare as well as timely availability and analysis of outcomes performance data that can enable evaluation of prevention interventions. The public health portal of the CCofSP is a starting point to provide the necessary data to assess and analyze preventive healthcare practices of community providers, promote adoption of evidence-based preventive practices, and to enable outcomes evaluation of public health interventions.

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